

Listing of Claims:

The following is a complete listing of the claims. Please note that claims 1, 9, 12, 17 and 18 are being amended and claims 2, 3, 11, 15, 16, 19 and 20 are being cancelled. Further, claims 21-36 are being added.

1. (Currently Amended) An apparatus for heat treating semiconductor wafers comprising:

a thermal processing chamber adapted to contain a semiconductor wafer;

and

a heating device in communication with said thermal processing chamber for heating a semiconductor wafer contained in said chamber, said heating device comprising:

(a) a plurality of light energy sources configured to emit light energy onto said semiconductor wafer, said light energy sources comprising linear lamps horizontally oriented with respect to said wafer, said light energy sources being positioned so as to form an irradiance distribution across a surface of said wafer; and

(b) at least one tuning device positioned amongst said light energy sources, the tuning device comprising a plurality of lasers, said lasers emitting light energy at more than one wavelength ~~said tuning device being configured to change the irradiance distribution of said light energy sources in a manner for more uniformly heating said semiconductor wafer.~~

2. Cancel

3. Cancel

4. (Original) An apparatus as defined in claim 1, wherein said tuning device further comprises at least one focusing lens, said focusing lens being configured to focus light energy being emitted by said tuning device.

5. (Original) An apparatus as defined in claim 1, further comprising a light pipe positioned in operative association with said tuning device for directing light energy being emitted by said tuning device onto said semiconductor wafer.

6. (Original) An apparatus as defined in claim 1, wherein said tuning device is positioned to heat the outer edges of said wafer.

7. (Original) An apparatus as defined in claim 1, further comprising:
at least one temperature sensing device for sensing the temperature of said semiconductor wafer at least at one location; and
a controller in communication with said at least one temperature sensing device and at least certain of said light energy sources, said controller being configured to control the amount of light energy being emitted by said light energy sources in response to temperature information received from said at least one temperature sensing device.
8. (Original) An apparatus as defined in claim 1, further comprising a substrate holder for holding said semiconductor wafer, said substrate holder being configured to rotate said wafer.
9. (Currently Amended) An apparatus as defined in claim 3 1, wherein at least one said laser emits p-polarized light.
10. (Original) An apparatus as defined in claim 9, wherein said laser emits light energy having an angle of incidence relative to said semiconductor wafer of about 40° to about 85°.
11. Cancel
12. (Currently Amended) An apparatus for heat treating semiconductor wafers comprising:
a thermal processing chamber adapted to contain a semiconductor wafer;
a substrate holder positioned within said thermal processing chamber, said substrate holder being configured to hold said semiconductor wafer and rotate said wafer in said chamber; and
a heating device in communication with said thermal processing chamber for heating a semiconductor wafer contained in said chamber, said heating device comprising:
(a) a plurality of linear lamps configured to emit light energy onto said semiconductor wafer, said linear lamps being horizontally oriented with respect to said wafer and extending from one side of said thermal processing chamber to an opposite side, said linear lamps being positioned so as to form an irradiance distribution across the surface of said wafer; and

(b) a plurality of tuning devices, said tuning devices being configured to emit focused light energy onto particular locations of said wafer ~~thereby changing the irradiance distribution of the linear lamps in a manner for more uniformly heating said semiconductor wafer~~, at least certain of said tuning devices being positioned to heat the outer most edges of said semiconductor wafer and wherein the tuning devices comprise lasers, said lasers emitting light energy at more than one wavelength.

13. (Original) An apparatus as defined in claim 12, further comprising:
at least one temperature sensing device for sensing the temperature of said semiconductor wafer at least at one location; and
a controller in communication with said temperature sensing device, with at least certain of said linear lamps, and with said tuning devices, said controller being configured to control the amount of light energy being emitted by said linear lamps and said tuning devices in response to temperature information received from said temperature sensing device.

14. (Original) An apparatus as defined in claim 13, wherein said controller is configured to control the amount of light energy being emitted by said tuning devices independently of said linear lamps.

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17. (Currently Amended) An apparatus as defined in claim ~~45~~ 13, wherein at least one of the said lasers emit p-polarized light.

18. (Currently Amended) An apparatus as defined in claim ~~45~~ 13, wherein said lasers emit light onto said wafer at an angle of incidence of from about 40° to about 85°.

19. Cancel

20. Cancel

21. (New) An apparatus for heat treating semiconductor wafers comprising:
a thermal processing chamber adapted to contain a semiconductor wafer;
a substrate holder positioned within the thermal processing chamber, the substrate holder being configured to hold the semiconductor wafer in the chamber;

a first heating device in communication with the thermal processing chamber for heating a semiconductor wafer contained in the chamber; and

a second heating device comprising a plurality of tuning devices that emit light energy onto the semiconductor wafer, the tuning devices comprising lasers, the lasers emitting light energy at more than one wavelength.

22. (New) An apparatus as defined in claim 21, wherein at least one of the lasers is in communication with a focusing lens, the focusing lens being configured to focus light energy being emitted by the at least one laser.

23. (New) An apparatus as defined in claim 21, wherein at least one of the lasers is positioned to emit light energy onto the outer edges of the wafer.

24. (New) An apparatus as defined in claim 21, further comprising:
at least one temperature sensing device for sensing the temperature of the semiconductor wafer; and
a controller in communication with the at least one temperature sensing device and the first heating device, the controller being configured to control the amount of energy being emitted by the first heating device in response to temperature information received from the at least one temperature sensing device.

25. (New) An apparatus as defined in claim 21, wherein the substrate holder is configured to rotate the wafer.

26. (New) An apparatus as defined in claim 21, wherein at least one of the lasers emits p-polarized light.

27. (New) An apparatus as defined in claim 21, wherein at least one of the lasers emits light energy having an angle of incidence relative to the semiconductor wafer of about 40° to about 85°.

28. (New) An apparatus as defined in claim 26, wherein at least one of the lasers emits light energy having an angle of incidence relative to the semiconductor wafer of about 40° to about 85°.

29. (New) An apparatus as defined in claim 24, wherein the controller is also configured to control the second heating device independently of the first heating device.

30. (New) An apparatus as defined in claim 21, wherein each of the lasers emits light onto the wafer at an angle of incidence of from about 40° to about 85°.

31. (New) An apparatus as defined in claim 1, wherein the tuning device is moved in relation to the semiconductor wafer in order to change the location of where the light energy being emitted by the tuning device contacts the wafer.

32. (New) An apparatus as defined in claim 12, wherein the plurality of tuning devices are movable in relation to the wafer in order to change the location of where the light energy being emitted by the tuning devices contacts the wafer.

33. (New) An apparatus as defined in claim 21, wherein the plurality of tuning devices are movable in relation to the semiconductor wafer in order to change the location of where the light energy being emitted by the second heating device contacts the wafer.

34. (New) An apparatus as defined in claim 21, further comprising:
at least one temperature sensing device for sensing the temperature of the semiconductor wafer; and
a controller in communication with the at least one temperature sensing device and the first heating device, the controller being configured to control the amount of energy being emitted by the second heating device in response to temperature information received from the at least one temperature sensing device.

35. (New) An apparatus as defined in claim 1, wherein said laser emits light energy having an angle of incidence relative to said semiconductor wafer of about 40° to about 85°.

36. (New) An apparatus as defined in claim 17, wherein said lasers emit light onto said wafer at an angle of incidence of from about 40° to about 85°.